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942,648 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

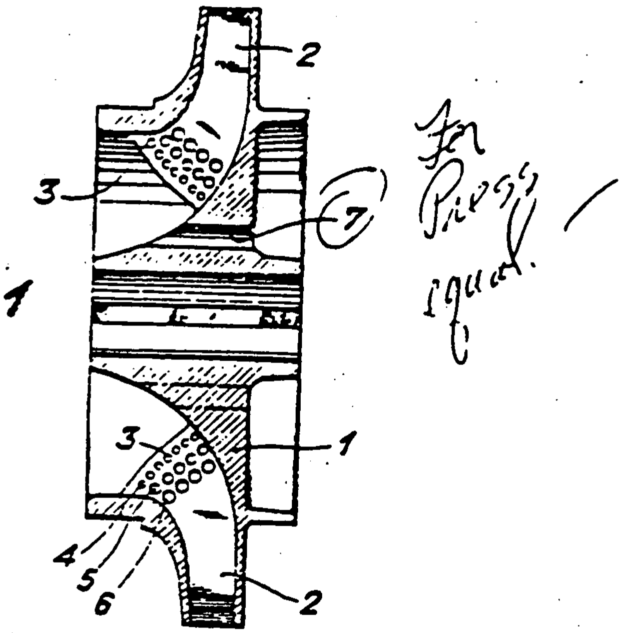
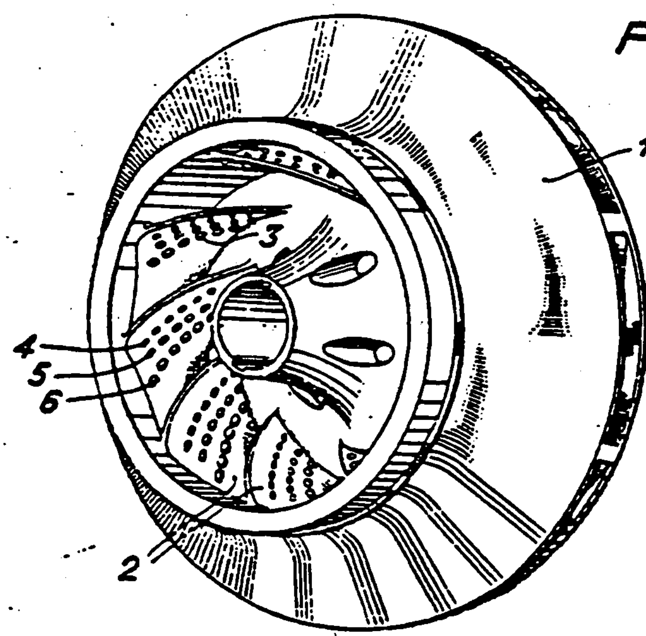


Fig. 1

Fig. 2



PATENT SPECIFICATION

DRAWINGS ATTACHED

942,648

942,648

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COMPLETE SPECIFICATION

Centrifugal Pumps

We, SULZER FRÈRES, SOCIÉTÉ ANONYME, a Company organised under the Laws of Switzerland, of Winterthur, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to centrifugal pumps.

Where it is required to convey large quantities of liquid, as with condensates in steam power stations, it is preferred to use a centrifugal pump having a large inlet. With such a pump there may be considerable pressure surges in some conditions of operation. Quite apart from the fact that such surges upset normal operation, they should be suppressed in order to prevent pumps and pipes from being damaged. The surges occur when, for a given delivery adjusted by a flow controller in the delivery pipe, the absolute value of the inlet head of the liquid is in a critical range. If the delivery is altered by adjusting the controller, the pressure surges are produced at a different inlet head. These inlet heads are always several times greater than the inlet heads at which cavitation phenomena occur.

Previously, such surges have been suppressed by very rapid alteration of the delivery in order to effect a shift away from the critical range, because it is usually impossible to alter the inlet head rapidly enough. The disadvantage of this rapid alteration of the delivery is that the delivery is affected without regard to any other kind of delivery control, for instance, in dependence on an operational variable.

According to the invention, the blades of the rotor of the first (or only) stage of the pump are provided with a number of perforations near their leading edges.

At inlet heads at which pressure surges would occur in the absence of apertures, no such surges occur when the perforations are present. The control range over which normal operation can be provided is thus advantageously increased; indeed, the invention may in some cases enable surging to be obviated completely. Conditions in respect of cavitation are not affected; in particular, cavitation does not occur any earlier than would be the case with no perforations. Also, there is only a small decrease in efficiency.

The perforations can be disposed perpendicularly to the blade surface irregularly or in rows parallel to the leading edge; the diameters of the perforations can be equal to or different from one another, while the perforations in a row may be equally or unequally spaced. Where there are three or more rows of perforations the spacings between the rows may be equal or unequal. The diameters of the perforations, at least in the first rows, can increase from front to rear. In the case of multi-stage centrifugal pumps, the surges can be obviated if the blades of the rotor of only the first stage are perforated.

The invention may be performed in various ways and a specific embodiment will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal section through the rotor; and

Figure 2 is a perspective view of the rotor.

Referring to the drawings, the rotor 1 of a centrifugal pump has blades 2. Each blade 2 is provided with perforations 3 in its front part, i.e. near the leading edge. In the embodiment illustrated, the perforations 3 are arranged in three rows 4—6 which extend parallel with the leading edge of each blade. The diameters of the perforations increase from row to row in the direction of flow, being larger in row 5 than in row 4 and larger in row 6 than in row 5. Conventional passages 7 extending parallel with

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the rotor axis are provided in the rotor to equalise the pressure on either side thereof. The rotor illustrated in the drawings can be used for a single-stage pump or as rotor of the first stage of a multi-stage pump.

WHAT WE CLAIM IS:—

1. A centrifugal pump in which the blades of the rotor of the first (or only) stage are provided with a number of perforations near their leading edges.

2. A centrifugal pump as claimed in Claim 1 in which the perforations are disposed in at least one row.

3. A centrifugal pump as claimed in Claim 2 in which the diameters of all the perforations in a row are equal.

4. A centrifugal pump as claimed in Claim 2 in which there are at least two rows of perforations and the diameters of the perforations of the various rows are of different sizes.

5. A centrifugal pump as claimed in Claim 4 in which the diameters of the perforations in at least the leading rows increase in size from front to rear.

6. A centrifugal pump as claimed in any of Claims 2 to 5 in which the perforations in a row are equally spaced.

7. A centrifugal pump as claimed in any of Claims 2 to 5 in which the perforations in a row are unequally spaced.

8. A centrifugal pump as claimed in any of Claims 2 to 7 in which there are at least three rows of perforations and the spacings between the rows are equal.

9. A centrifugal pump as claimed in any of Claims 2 to 7 in which there are at least three rows of perforations and the spacings between the rows are unequal.

10. A centrifugal pump substantially as described with reference to the accompanying drawings.

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